A NOVEL APPROACH FOR CONGESTION CONTROL, AMBULANCE CLEARANCE AND STOLEN VEHICLE DETECTION SYSTEM USING RF MODULE

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ABSTRACT

This paper presents an smarttraffic control system to pass emergency vehicles smoothly. For implementing intelligent Traffic control for Congestion, Ambulance Clearance, and stolen vehicle Detection. Each separate vehicle is arranged with special radio frequency identification (RFID) tag, which makes it impossible to remove or destroy. Here we using RFID reader, and PIC16F877A system-on-chip to read the RFID tags attached to the vehicle. It counts number of vehicles that passes on a particular path during a specified duration. It also determines the network congestion, and hence the green light period for that path. When an ambulance is approaching the junction, it will connect to the traffic controller in the junction to turn ON the green light. This uses RF modules and PIC16F877 and a system-on-chip for wireless communications between the ambulance and traffic controller. The prototype was tested under different combinations of inputs in our wireless communication laboratory and experimental results were found as expected.

KEYWORDS: RF module, GSM, PIC16F877, Ambulance clearance and stolen vehicle, congestion control, Traffic junction.

1. INTRODUCTION

The growth of Industrialization and population, there has been a tremendous growth in the traffic. With growth in traffic, there is occurrence of bundle of problems too, these problems include traffic jams, accidents and traffic rules violation at the heavy traffic signals. This in turn has an adverse effect on the economy of the country as well as the loss of lives. The expected increase of cars and SUVs from 2005 to 2035 is 13 times (35.8 million to 236.4 million vehicles), while two wheelers are expected to increase about 6.6 times(35.8 million to 236.4 million vehicles).

In recent years, wireless networks are widely used in the road transport as they provide more cost effective options. Technologies like RF, RFID and GSM can be used in traffic control to provide cost effective solutions. RFID is a wireless technology that uses radio frequency electromagnetic energy to carry information between the RFID reader. Some RFID systems will only work within the range inches or centimeters, while others may work for AT A GSM modem is a specialized type of modem, which accepts a SIM card and operates over a subscription to a mobile operator, just like a mobile phone commands are used to control modems.

2. LITERATURE SURVEY

With automatic traffic signal control based on the traffic density in the route, the manual effort on the part of the traffic policeman is saved. As the entire system is automated, it requires very less human intervention. With stolen vehicle detection, the signal automatically turns to red, so that the police officer can take appropriate action, if he/she is present at the junction. Also SMS will be sent so that they can prepare to catch the stolen vehicle at the next possible junctions. Emergency vehicles like ambulance, fire trucks, need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, precious lives of many people may be in danger. With emergency vehicle clearance, the traffic signal turns to green as long as the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through. Further enhancements can be done to the prototype by testing it with longer range RFID readers. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known. Currently, we have implemented system by considering one road of the traffic junction. It can be improved by extending to all the roads in a multi-road junction.[1]

The efficient techniques to control the traffic light sequence but these are not to provide the QoS to Special Vehicle.

It considers not only the priority of the vehicles but also the density of the vehicles on the road and controls the traffic light sequence efficiently and more accurately and the accuracy of the RFID is more than Camera's so it also improves the performance of traffic light Violation Detection System[2].This system will definitely help to traffic police to give the way to the ambulance when there is heavy

traffic on the road. Also the condition of patient ismonitored and this information is send to the respective doctor so that doctor can prep this paper, a novel idea is proposed for providing a green path to the emergency vehicles. Most of the traffic signals are static in nature and requires modification to reduce the possibilities of traffic jams and provide clearance to emergency vehicles. The system shows promising results, since active RFID technology permits to detect the presence and identify the emergency vehicle in advance sufficiently in advance. It is directly targeted for traffic management so that emergency vehicle on the road get clear. This system will definitely help to give a smooth flow to the emergency vehicle when there is heavy traffic on the road and gives a powerful solution to improve existing system with the new automated traffic light controller. It can be extended to provide to provide communication from one vehicle to other for a smooth flow of traffic.[4]

In the next process before the patient reach to the hospital. The design and implementation of this technique is directly targeted for traffic management so that emergency vehicle on road get clear way to reach there destination in less time and without any human interruption. The main feature of this operation is the ability to communicate with purpose using GSM and GPS. It is very smart to find the location of emergency of VIP vehicle and get clear path to pass on.[3]

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In this method the vehicle tracking and locking systems used to track the theft vehicle by using GPS and GSM technology, it is evident that the proposed Microcontroller, GPS, GSM and RFID based smart system for the remote vehicle monitor, control, security and fuel management purpose, has a Business Intelligence (BI) capabilities. Hence, this smart system for vehicle monitoring, controlling and security will helps to the vehicle owner or operational Manager of transport business to operate their vehicles with maximum security and efficiency by gaining the real time insights from remote vehicle to make the optimal and timely decisions.[6]

3. EXTRACTING KNOWLEDGE FROM EXISTING METHOD

In this existing system RFID is used. RFID reader will track how many vehicles have passed through for a specific period of time and determines the congestion volume. Accordingly, it sets the green light duration for that path. Second part is for the emergency vehicle clearance. Here, each emergency vehicle contains ZigBee transmitter module and the ZigBee receiver will be implemented at the traffic junction. The buzzer will be switched ON when the vehicle is used for emergency purpose.

4. PROPOSED METHOD

In the proposed method we hadusing the following technologies to solve the current problem section, it can be seen that, existing technologies are insufficient to handle the problems of congestion control, emergency vehicle clearance, stolen vehicle detection, etc. To solve these problems, we propose to implement our Intelligent Traffic Control System.It mainly consists of three parts. First part contains automatic signal control system. Here, each vehicle is equipped with an RFID tag. When it comes in the range of RFID reader, it will send the signal to the RFID reader. The RFID reader will track how many vehicles have passed through for a specific period and determines the congestion volume. Accordingly, it sets the green light duration for that path. Second part is for the emergency vehicle clearance.
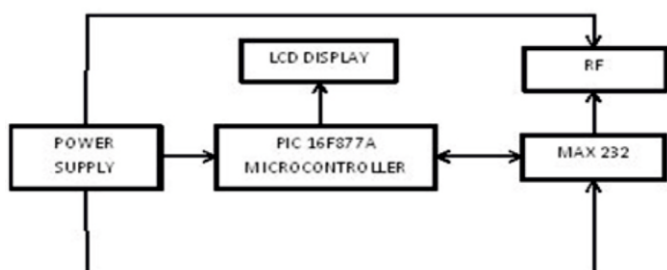
BLOCK DIAGRAM OF TRANSMITTER

Figure:1 Transmitter

Here, each emergency vehicle contains RF transmitter module and the RF receiver will be implemented at the traffic junction. The buzzer will be switched ON when the vehicle is used for emergency purpose.
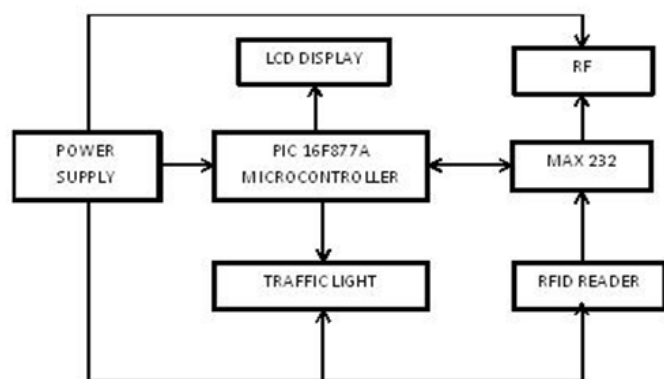
BLOCK DIAGRAM OF RECEIVER

Figure :2 Receiver

This will send the signal through the RF transmitter to the RF receiver. It will make the traffic light to change to green. Once the ambulance passes through, the receiver no longer receives the RF signal and the traffic light is turned to red. The third part is responsible for stolen vehicle detection. Here, when the RFID reader reads the RFID tag, it compares it to the list of stolen RFIDs. If a match is found, it sends SMS to the police control room and changes the traffic light to red, so that the vehicle is made to stop in the traffic junction and local police can take appropriate action. List of components used in the experiment are CC2500RF module, Microchip PIC16F877A, RFID Reader–125KHz–TTL and SIM300 GSM.

❖ **Microcontroller (PIC16F877A)**

Peripheral Interface Control (PIC) 16F series has a lot of advantages as compared to other series. It executes each instruction in less than 200 nanoseconds. It has 40 pins and has 8K program memory and 368 byte data memory. It is easy to store and send UINs. At the junction, it is easy to store large number of emergency vehicles. Before switching to green, it should satisfy all the conditions. It is easy to switch any time. It consumes less power and operates by vehicle battery itself without any extra hardware.

❖ **GSM MODULE**

Here, a GSM modem is connected with the microcontroller. This allows the computer to use the GSM modem to communicate over the mobile network. These GSM modems are most frequently used to provide mobile Internet connectivity, many of them can also be used for sending and receiving SMS and MMS messages. GSM modem must support an ―extended AT command set‖ for sending/receiving SMS messages. GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery. SIM 300 is designed for global market and it is a tri-band GSM engine. It works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900MHz. SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes. This GSM modem is a highly flexible plug and play quad band GSM modem, interface to RS232, it supports features like voice, data, SMS, GPRS and integrated TCP/IP stack. It is controlled via AT commands. It uses AC – DC power adaptor with following ratings DC Voltage: 12V/1A

❖ **RFID READER**

Radio Frequency Identification (RFID) is an IT system that transmits signals without the presence of physical gadgets in wireless communication. It is categorized under automatic identification technology, which is well established protocol. The working of an RFID system is very simple. The system utilizes tags that are attached to various components to be tracked. The tags store data and information concerning the details of the product of things to be traced. The reader reads the radio frequency and identifies the tags. The antenna provides the means for the integrated circuit to transmit its information to the reader. There are two types of RFID categories, active and passive tags. The tags that do not utilize power are referred to as passive and they are driven by an antenna that enables the tag to receive electromagnetic waves from a reader. On the contrary, active tags rely on power and they have inbuilt power sources that enable it to send and receive signals from RFID reader.

RFID range depends on transmit power, receive sensitivity and efficiency, antenna, frequency, tag orientations, surroundings. Typically, the RFID range is from a few centimeters to over hundred meters. RFID reader uses frequency 125 KHz with a range of 10 cm.

❖ **Radio Frequency**

A radio frequency (RF) signal refers to a wireless electromagnetic signal used as a form of communication, if one is discussing wireless electronics. Radio waves are a form of electromagnetic radiation with identified radio frequencies that range from 3Hz to 300 GHz. Frequency refers to the rate of oscillation (of the radio waves.) RF propagation occurs at the speed of light and does not need a medium like air in order to travel. RF waves occur naturally from sun flares, lightning, and from stars in space that radiate RF waves as they age. Humankind communicates with artificially created radio waves that oscillate at various chosen. frequencies. RF communication is used in many industries including television broadcasting, radar systems, computer and mobile platform networks, remote control, remote metering/monitoring, and many more.
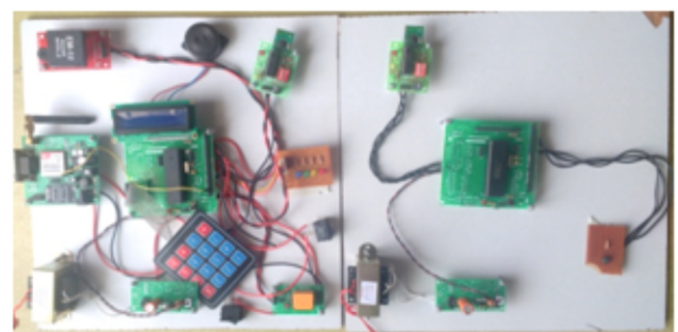
5. RESULT AND DISCUSSION

Figure :3 Snapshot of our designed kit

Automatic Signal Control System

In this module, for experiment purpose, we have used passive RFID tags and RFID reader with frequency 125 KHz. RFID tag, when vehicle comes in the range of the receiver will transmit the unique RFID to the reader. The microcontroller Connected to the RFID reader will count the RFID tags read in 2 minute duration. For testing purpose, if the count is more than 10, the green light duration is set to 30 seconds, if count is between 5 and 9, the green light duration is set to 20 seconds. If the count is less than 5, the green light duration is set to 10 seconds. The red light duration will be for 10 seconds and orange light duration will be for 2 seconds.

Stolen Vehicle Detection System

In this module, for testing purpose, we compare the unique RFID tag read by the RFID reader to the stolen RFIDs stored in the system. If a match is found, then the traffic signal is immediately turned to red for a duration of 30 seconds. Also an SMS is sent specifying the RFID number by using SIM300 GSM module. The

LCD display will indicate that stolen vehicle is present

Emergency Vehicle Clearance System
In this module, there are 2 parts, first part which is ZigBee transmitter is placed in the emergency vehicle. Proposed model images transmitter and receiver. (a) Pole status at different condition. (b) Transmitter (ZigBee). (c) LCD display at receiver. (d) Detailed image of receiver.(e) When stolen vehicle is detected. (f) Working model. Switch is pressed, it will transmit the signal. The signal contains unique id and security code. The transmitter contains PIC16F877A microcontroller and ZigBee

(e) module. The microcontroller sends the commands and data to the ZigBee via serial communication. Second part is the receiver, which is placed at traffic pole. It also contains PIC16F877Amicrocontroller and ZigBee module. The receiver compares the security code received to the security code present in its database. If it matches, then it will turn the green light on. For testing purpose, we used short range RFID reader in our prototype. First, the receiver part is turned on. The red and green signal will be on for 10 seconds duration and orange light will be on for 2 seconds duration one after the other. Secondly, we bring the RFID of stolen vehicle into the range of RFID reader. Then we bring 12 RFIDs into the range of RFID reader

6.CONCLUSION
With automatic traffic signal control based on the traffic density in the route, the manual effort on the part of the traffic policeman is saved. As the entire system is automated, it requires very less human intervention. With stolen vehicle detection, the signal automatically turns to red, so that the police officer can take appropriate action, if he/she is present at the junction. Also SMS will be sent so that they can prepare to catch the stolen vehicle at the next possible junctions. Emergency vehicles like ambulance, fire trucks, need to reach their destinations at the earliest. If they spend a lot of time in traffic jams, precious lives of many people may be in danger. With emergency vehicle clearance, the traffic signal turns to green as long as the emergency vehicle is waiting in the traffic junction. The signal turns to red, only after the emergency vehicle passes through. Further enhancements can be done to the prototype by testing it with longer range RFID readers. Also GPS can be placed into the stolen vehicle detection module, so that the exact location of stolen vehicle is known. Currently, we have implemented system by considering one road of the traffic junction. It can be improved by extending to all the roads in a multi-road junction.

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